

THE NEARCTIC SPIDER GENUS  
*PISAURINA* (PISAURIDAE)

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This paper is part of a series of systematic studies on American spiders of the family Pisauridae and is concerned specifically with a re-examination of the revision of this family by Bishop (1924) as it occurs in the United States. Since Bishop's work, numerous collections have become available to help provide a better understanding of the distribution and variation of each species. Additionally, new approaches to the study of systematics have given better insight into the evolutionary relationships within the group and have brought about a realignment in its generic and specific classification. The purpose of this paper, therefore, is to bring up-to-date the available information on the systematics of the genus *Pisaurina*.

*Pisaurina* is a rather common genus found in eastern North America and Cuba, and one species, *P. mira*, is well known within its large area of distribution. The pisaurids are commonly referred to as nursery web spiders because of the habits of many members of the family, and *Pisaurina* seems not to be an exception. Species of *Pisaurina* are not as closely associated with the aquatic habitat as is *Dolomedes*, the only other known genus of pisaurids within the same geographic range (see Carico, in press). Instead, they appear to be wandering spiders which are typically found on vegetation and are frequently collected by such methods as sweeping and searching among weeds and shrubs. The natural history is considered further in the analysis of each species below.

**DISTRIBUTION AND EVOLUTION.** As previously stated, *Pisaurina* has a distribution restricted primarily to eastern North America, but the distributions of individual species within this area bear some basic similarities to the ranges of certain species of *Dolomedes*, and thus there is an invitation to make comparisons between the two genera. In *Pisaurina*, as in *Dolomedes*, there are two species in the genus, specifically *P. mira* and *P. brevipes*, which have a very wide distribution in eastern North America (Maps 1, 2) while the remaining two species, *P. undulata* and *P. dubia*, are restricted principally to the Coastal Plain and Piedmont regions of the United

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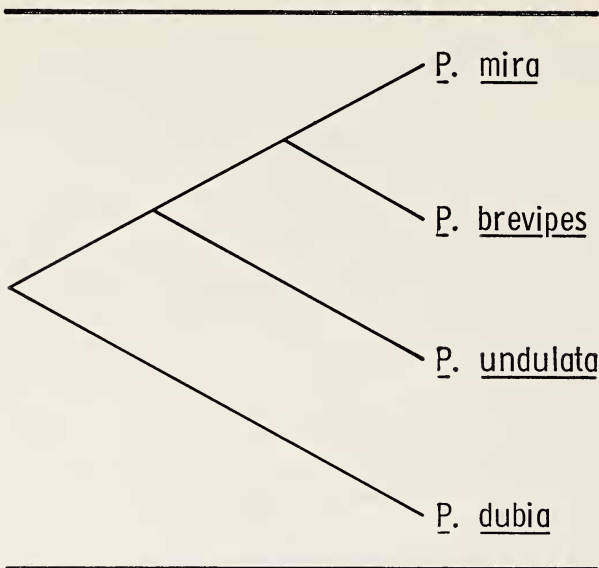


Diagram 1. Dendrogram of species of *Pisaurina* based on the structure of male pedipalpi.

States (Maps 3, 4). An explanation for this type of distribution is that speciation could have occurred as a result of genetic isolation consequent with the Pleistocene shoreline changes which produced isolated islands in the region of the state of Florida. The southern species, then, emerged on these islands and spread northward later when the islands were once more connected with the mainland. A more detailed discussion of this type of distribution as it occurs in *Dolomedes* is found elsewhere (Carico, in press). The phylogenetic relationships are shown in a dendrogram (Diagram 1). Two species, *P. mira* and *P. brevipes*, are very similar in general morphology, eye pattern and genitalia, and are more closely related than any other pair. They have been confused frequently, but there are very good characters which separate them. The remaining two species are rather enigmatic in that their general morphologies and eye patterns are similar, while their genitalia, particularly the male palpi, are quite different from each other. The male palpi, perhaps the best indicators of interspecific relationships, are used as a basis for speculation on the phylogeny of the genus.

Some arachnologists have wondered about the relationships be-

tween *Pisaurina* and the European genus *Pisaura*. A comparison of the genitalia of the two shows no congeneric similarity.

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#### *Pisaurina* Simon

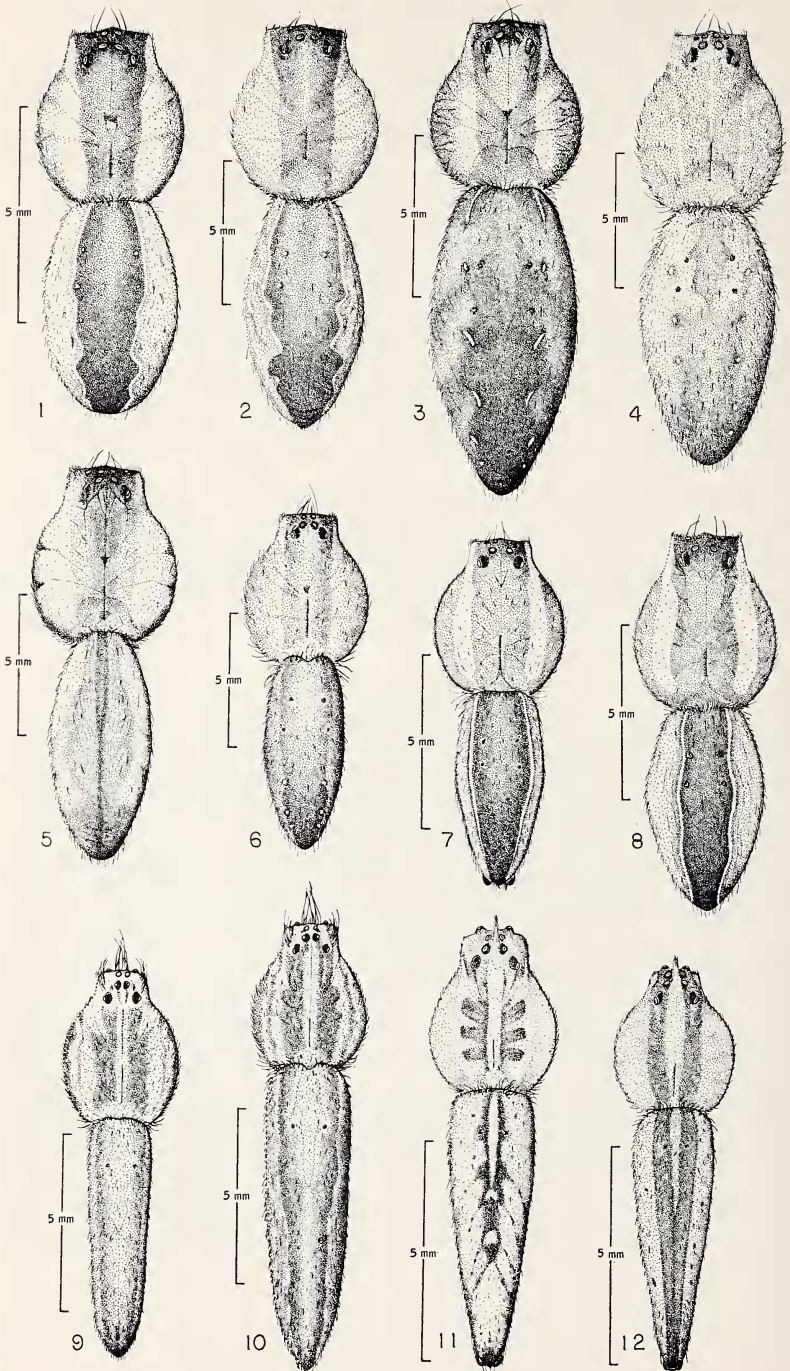
*Dapanus* Hentz, 1867, Proc. Boston Soc. Natur. Hist. 11: 4. Type species originally designated for this subgenus to be *Micrommata marmorata* Hentz, 1847, a synonym of *Dolomedes mirus* Walckenaer, 1837. The International Commission on Zoological Nomenclature has been petitioned to suppress the name *Dapanus*.

*Pisaurina* Simon, 1898, Hist. Natur. Araignées, 2: 295. Type species originally designated as *Dolomedes mirus* Walckenaer, 1937. Bishop, 1924, Bull. New York State Mus., 252: 22-23. Roewer, 1954, Katalog der Araneae, 2(a): 121. Bonnet, 1958, Bibliographia Araneorum 2: 3682.

*Thanatidius* Simon, 1898, Hist. Natur. Araignées, 2: 293. Type originally designated as *Thomisus* ? *dubius* Hentz 1847. Bishop, 1924, Bull. New York State Mus., 252: 16-17. Roewer, 1954, Katalog der Araneae 2(a): 125. Bonnet, 1959, Bibliographia Araneorum 2: 4396. NEW SYNONYMY.

*Pelopatis* Bishop, 1924, Bull. New York State Mus., 252: 20. Type species originally designated as *Tetragonophthalma undulata* Keyserling 1887. Roewer, 1954, Katalog der Araneae, 2(a): 117-118. Bonnet, 1958, Bibliographia Araneorum, 2: 3478 NEW SYNONYMY.

*Description. Carapace:* depressed to moderately high, longer than wide. *Eyes:* posterior row moderately recurved, PLE, PME,



AME subequal and larger than ALE. ALE tuberculate, anterior row nearly straight or strongly procurved, ocular quadrangle wider at top than at bottom. *Sternum*: lanceolate, longer than wide. *Chelicerae*: moderately robust with three promarginal, three retro-marginal teeth on fang furrow. *Legs*: spinose, variable in length, third pair always shortest. *Abdomen*: moderately long to quite longer than wide, slightly overlaps carapace. MALE: *Bulb of pedipalp*: *Median apophysis* directed somewhat retro-laterally, flattened, simple or bifid; *conductor* distal, usually broad, flattened with spine projecting retrolaterally; *embolus* long, slender, quite flexible, arising proximally or prolaterally, curving around behind distal margin of conductor. FEMALE. *Epigynum*: three elevations with concavity anterior to median concavity, carina along ental side of each lateral elevation. *Internal copulatory apparatus*: bursa copulatrix empties directly into conspicuous seminal receptacle, fertilization tubes loop back and forth several times across chitinous ridge.

#### KEY TO SPECIES OF PISAURINA

1. Height of clypeus at ALE less than half height of clypeus at AME; abdomen usually wider than carapace ..... 2  
 Height of clypeus at ALE more than half height of clypeus at AME; carapace usually wider than abdomen ..... 3
2. Width of ALE divided by width of PME = less than 1.5; conspicuous tuft of white hairs directed anteriorly from area between PME (missing from rubbed specimens) (Figs. 10, 11) ..  
 ..... *Pisaurina dubia*  
 Width of ALE divided by width of PME = more than 1.5; tuft of white hairs absent from area between PME .....  
 ..... *Pisaurina undulata*
3. Median dark band on dorsum of abdomen distinct and with straight or nearly straight border (Figs. 7, 8); patella-tibia I length/carapace length ratio less than 2.0 in males and usually less than 1.37 in females ..... *Pisaurina brevipes*  
 Median dark band on dorsum of abdomen indistinct, or if distinct then with undulated border (Figs. 1, 2); patella-tibia I length/carapace length ratio more than 2.0 in males and usually more than 1.37 in females ..... *Pisaurina mira*

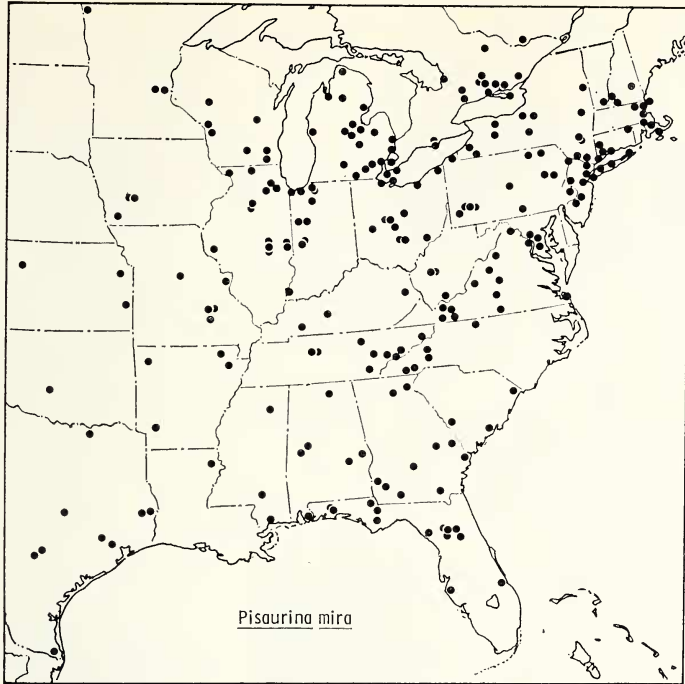
Figures 1-12, Color patterns of the dorsum. Figs. 1-6, *Pisaurina mira*. 1-5, Female. 6, Male. Figs. 7-8, *P. brevipes*. 7, Male. 8, Female. Figs. 9-10, *P. undulata*. 9, Male. 10, Female. Figs. 11-12, *P. dubia*. 11, Female. 12, Male.

*Pisaurina mira* (Walckenaer)

Figures 1-6, 13, 17, 18; Map 1

- Dolomedes mirus* Walckenaer, 1837, Hist. Natur. Insectes Aptères, 1: 357-358. Female holotype Abbot figure no. 321. Specimen from Georgia lost.
- Dolomedes virgatus* Walckenaer, 1837, Hist. Natur. Insectes. Aptères, 1: 358. Female holotype Abbot figure no. 291. Specimen from Georgia lost. Synonymized by Montgomery, 1904, Proc. Acad. Natur. Sci. Philadelphia, 56: 320-321.
- Micrommata undata* Hentz, 1847, Jour. Boston Natur. Hist. Soc. 5: 192-193, pl. 16, fig. 7, sex unknown. Holotype from Alabama, destroyed. First synonymized by Simon, 1898, Hist. Natur. Araignées, 2: 295.
- Micrommata serrata* Hentz, 1847, Jour. Boston Natur. Hist. Soc. 5: 193, pl. 16, fig. 8, sex unknown. Holotype from North Alabama, destroyed. Synonymized with *Ocyale undata* (Hentz) by Emerton, 1885, Trans. Connecticut Acad. Arts, Sci., 6: 499.
- Micrommata marmorata* Hentz, 1847, Jour. Boston Natur. Hist. Soc. 5: 193-194, pl. 17, fig. 5, female. Holotype from North Alabama, destroyed. Synonymized to *Pisaurina undata* (Hentz) by Banks, 1910, Bull. United States Nat. Mus., 72: 54.
- Micrommata carolinensis* Hentz, 1847, Jour. Boston Natur. Hist. Soc. 5: 194, pl. 16, fig. 9, (?) immature male. Holotype from North Carolina or Alabama, destroyed. Emerton, 1875, in Hentz, 1875, Occ. Pap. Boston Natur. Hist. Soc. 2: 45, pl. 20, fig. 4, ♂, ♀. Synonymized to *Ocyale undata* (Hentz) by Emerton, 1885, Trans. Connecticut Acad. Arts, Sci., 6: 499.
- Micrommata subinflata* Hentz, 1850, Jour. Boston Natur. Hist. Soc., 6: 288, pl. 10, fig. 13, (?) female. Holotype from South Alabama, destroyed. First synonymized by Bishop, 1924, Bull. New York State Mus. 252: 25.
- Pisaurina mira*, -Simon, 1898, Hist. Natur. Araignées, 2: 295. Comstock, 1912, The Spider Book, p. 607, figs. 683, 687, 691, 692. Bishop, 1924, Bull. New York State Mus. 252: 23-29, pl. 5, 6, 8-11, ♂, ♀. Roewer, 1954, Katalog der Araneae, 2(a): 121-122. Bonnet, 1958, Bibliographia Araneorum 2: 3682-3683.
- Pisaurina mira* var. *subinflata*, -Bishop, 1924, Bull. New York State Mus., 252: 25, pl. 7, fig. 1, pl. 9, fig. 6, ♀. Bonnet, 1958, Bibliographia Araneorum 2: 3683-3684.
- Pisaurina subinflata*, -Roewer, 1954, Katalog der Araneae, 2(a): 122.

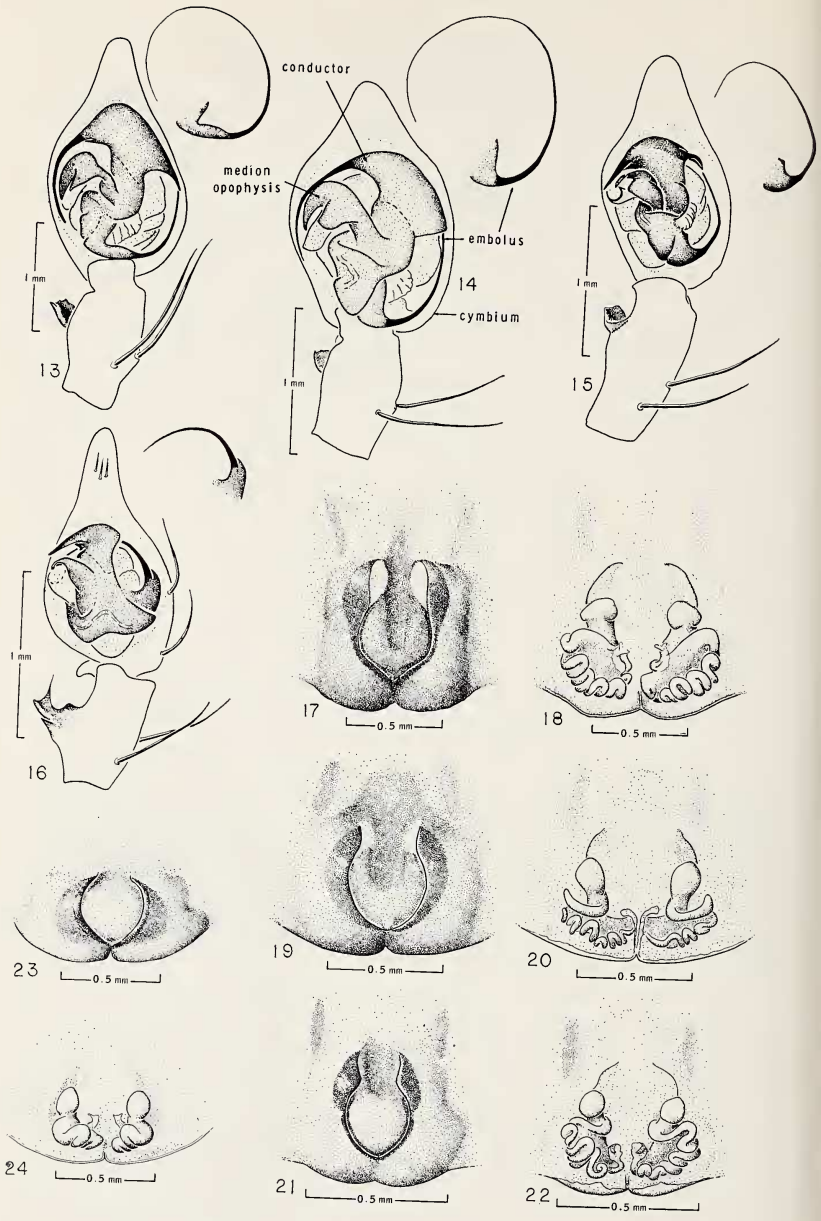
*Diagnosis.* The nearly straight anterior row of eyes clearly distinguishes this species from *P. undulata* and *P. dubia* which have strongly recurved anterior rows. It most resembles the closely related *P. brevipes* in general body form, but is distinguished from it by the pattern of the dorsum, which in the latter species, there is on the abdomen, a dark, dorsal, median band present with straight or nearly straight borders, and there are light dorsolateral bands with distinct borders. Additionally, both sexes have proportionally longer legs in *P. mira*.



Map 1. Distribution of *Pisaurina mira* (Walckenaer).

*Description.* *Carapace:* moderately high. *Eyes:* anterior row nearly straight. *Legs:* (2-1-4)-3. *Abdomen:* moderately long, less than twice length of carapace, often notched anteriorly. *Pattern:* highly variable, ranges from distinct dark median band on abdominal dorsum with undulating margins to indistinct median band with two rows of lateral spots. Median band on carapace with lateral light areas varying in distinctness. (Figs. 1-6). *MALE.* Cymbium moderately broad, conductor expanded distally with long, curved spine retrolaterally; median apophysis bifid; embolus quite long, thin, arises proximally; patella-tibia I length/carapace length = AVE. 2.21 (range 2.02-2.45). (Fig. 13). *FEMALE.* Genitalia as in Figs. 17, 18; patella-tibia I length/carapace length = AVE. 1.50 (range 1.34-1.62). *IMMATURES.* Body form, pattern similar to adults.

*Natural history.* This is the most common species of the genus and is one of the most common spiders in eastern North America. Correspondingly, we have more natural history data pertaining to it than any other *Pisaurina* species.





According to collecting notes, females and immatures are most often collected while sweeping grass and shrubs. All stages and sexes were collected in woods, but more often in meadows or old fields. Males, apparently more prone to wandering, are collected in various kinds of pitfalls and traps. Mature males were collected primarily in May and June with fewer records in April and July. The earliest records are one in early February for Florida and two in March, one for Florida and one for Ohio. The latest records are in November for Florida and in September for New York. From the large collection of adult females, the distribution of collection records is as follows: March 5%, April 6%, May 19%, June 33%, July 23%, August 10%, and September 4%. The latest is a single November record from Michigan.

The construction of the nursery web, which is similar to that of *Dolomedes*, is given in detail by Bishop (1924) and will not be reviewed here. From personal observation and collection records, it seems that the nursery is almost always placed in high weeds or low shrubs in the ecotone between woods and adjoining field or meadow. Egg sacs appear in the collections primarily from the months of June and July, but appear as early as April and as late as September.

*Distribution.* Eastern North America from Ontario and Quebec southward to central Florida and the Rio Grande Valley of Texas, and westward to Minnesota, Kansas, and Oklahoma. (Map 1).

*Material examined.* Eighty-seven males, 208 females, 853 immatures.

*Discussion.* The numerous names given for this species in the past can be attributed to the extreme variability in its color pattern. Some of these dorsal patterns are illustrated (Figs. 1-5) and can be placed into a continuum; especially is this true for the abdomen. In the latter case, one can see a very distinct dark median band with lateral light areas (Fig. 1) which, when followed through the series of drawings, appears to break down in distinctness while the undulating white stripe breaks up into a series of white "dashes" (Fig. 3) and ultimately into a series of simple white dots (Fig. 4). The "subinflata" (Fig. 5) pattern perhaps indicates an extensive break-

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Figures 13-24, Genitalia of species of *Pisaurina*. Figs. 13-16, Ventral views of male right palpi. 13, *P. mira*. 14, *P. brevipes*. 15, *P. undulata*. 16, *P. dubia*. Figs. 17-22, Epigyna. Figs. 17-18, *P. mira*. 17, Ventral view. 18, Dorsal view. 19-20, *P. brevipes*. 19, Ventral view. 20, Dorsal view. 21-22, *P. undulata*. 21, Ventral view. 22, Dorsal view. 23-24, *P. dubia*. 23, Ventral view. 24, Dorsal view.

down in dark areas altogether because the color is generally very light with limited dark areas on the dorsum and legs.

*Pisaurina brevipes* (Emerton)

Figures 7, 8, 14, 19, 20; Map 2

*Pisaura brevipes* Emerton, 1911, Trans. Connecticut Acad. Arts Sci., 16: 400, pl. 4, fig. 6. Female holotype from Framingham, Massachusetts; deposited in the Museum of Comparative Zoology, examined.

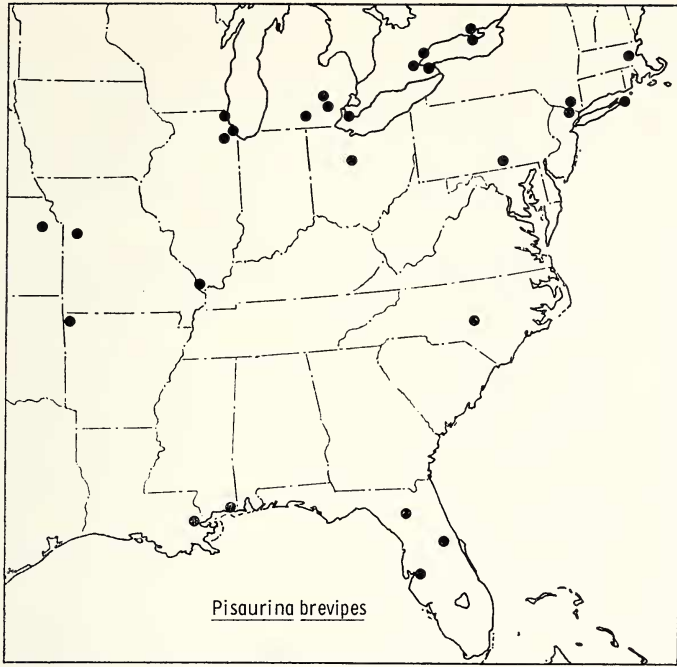
*Pisurina brevipes* -Bishop, 1924, Bull. New York State Mus., 252: 29-30, pl. 7, fig. 2, pl. 33, fig. 5, ♀. Roewer, 1954, Katalog der Araneae, 2(a): 121. Bonnet, 1958, Bibliographia Araneorum, 2: 3682.

*Diagnosis.* *Pisaurina brevipes* is distinguished from *P. undulata* and *P. dubia* by the nearly straight anterior eye row while the latter species have strongly procurved rows. It differs from the closely related *P. mira* by having a straight-bordered median dark band on the abdominal dorsum, and by having proportionally shorter legs.

*Description.* *Carapace:* moderately high. *Eyes:* anterior row nearly straight. *Legs:* (2-1-4)-3. *Abdomen:* moderately long, less than twice length of carapace, often notched anteriorly. *Pattern:* rather homogeneous with distinct submarginal bands on carapace, dark median abdominal band with straight or nearly straight borders adjoining white narrow stripes, distinct dorso-lateral light bands adjoining white stripes; general color in darker areas reddish brown (Figs. 7, 8). *MALE.* Cymbium broad; conductor expanded distally with long, curved spine retrolaterally; median apophysis bifid (Fig. 14); embolus quite long, thin, arises proximally; patella-tibia I length/carapace length = 1.50 (only 2 specimens). *FEMALE.* Genitalia as in Figs. 19, 20; patella-tibia I length/carapace length = AVE. 1.25 (range 1.13-1.42). *IMMATURES.* Body form, pattern similar to adults.

*Natural history.* Nothing is found in the literature about the biology of this species; however, there are a few notes with the collections that were examined. Of three males in the collections, one was found in a meadow and one in a "prairie." Only three biological notes were found with the females and were: "prairie," "in bog near highway," and "sweeping in swamp." The two notes found with the immatures were: "walls of building" and "roadside ditch." With this paucity of information, no distinction in habitat is made between this species and the closely related *P. mira*.

Two of the males were collected in May; one in Ohio and one in Arkansas, while the third was collected in Florida on the fourth of March. Females were collected throughout the warmer season be-



Map 2. Distribution of *Pisaurina brevipes* (Emerton).

ginning with an early record in Louisiana in middle March and ending with a late record in November for Florida.

Only two egg sacs were found: one from Michigan collected August second and one from Florida collected November second. A note in a May or June collection from Illinois concerning a nursery is as follows: "The large specimen had a bell-like web on or near top of stems. In this web were young." Thus, the nursery is apparently quite similar to that of *P. mira*.

*Distribution.* Eastern North America from Ontario, Michigan, and Massachusetts southward to Louisiana and central Florida, and westward to Kansas and Arkansas.

*Material examined.* Three males, 29 females, 28 immatures.

*Discussion.* The validity of this species has been the subject of some confusion as can be seen in the identifications accompanying the museum collections. Although Bishop (1924) upheld the validity of the species, the most convincing characters for this point of view, however, were not available to him because they are found on

the male palpus, and apparently no males were in the collections which he examined. Bishop used the pattern as a distinguishing character, but, although valid, it appears to fit well into the range of variation of *P. mira* and therefore seemed rather dubious. He also failed to take note of one of Emerton's original characters, the comparative lengths of the leg I and body, which when converted to a ratio between the patella-tibia and carapace length, proves to be statistically valid.

Only three males are known to exist in collections and are in the Exline-Peck collection, Ohio State University museum, and the American Museum of Natural History.

*Pisaurina undulata* (Keyserling), new combination

Figures 9, 10, 15, 21, 22; Map 3

*Tetragonophthalma undulata* Keyserling, 1887, Verhandl. K. K. Zool.-Bot.

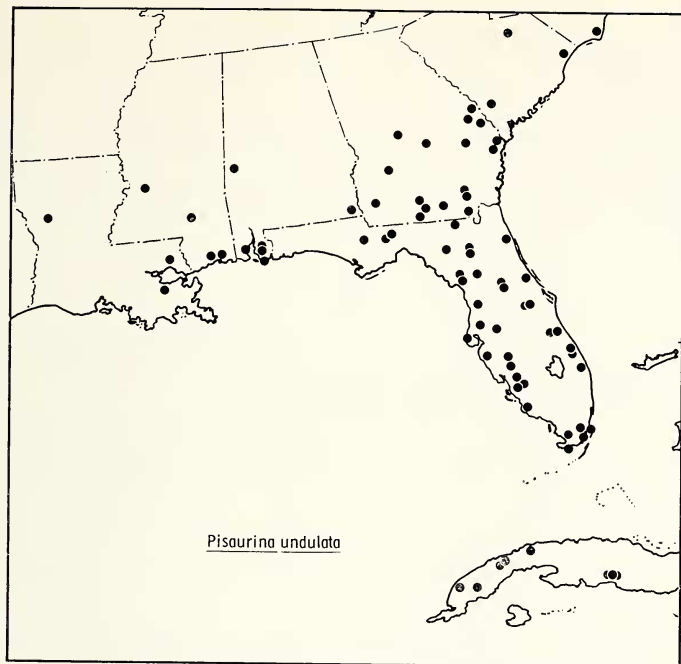
Wien. 37: 486-488. Female holotype from Archer, Florida, deposited in the American Museum of Natural History, New York, examined.

*Thanatidius dubius*, -Comstock, 1912, The Spider Book, pp. 605-606, fig. 690, ♀. (Misidentification).

*Pelopatis undulata*, -Bishop, 1924, Bull. New York State Mus., 252: 21-22, pl. 3-4. Roewer, 1954, Katalog der Araneae, 2(a): 117-118. Bonnet, 1958, Bibliographia Araneorum, 2: 3478.

*Diagnosis.* This species is easily distinguished from *P. mira* and *P. brevipes* by the strongly recurved anterior eye row while the latter two species have the eye row straight or nearly so. *Pisaurina undulata* differs from *P. dubia* because in the former species the width of the PME exceeds 1.5 the width of the ALE, while in the latter species the ratio is less than 1.5. Additionally, of the two latter species, only *P. dubia* has a triangular group of white hairs projecting forward from the area between the AME. However, *P. undulata* has rows of prominent curved spines in the eye region. The genitalia of the latter also differ.

*Description.* *Carapace:* wider than abdomen; depressed; rows of curved spines behind AME and on side of clypeus. *Eyes:* anterior row strongly recurved; ALE near margin of clypeus and prominently tuberculate. *Legs:* 1-(4-2)-3. *Abdomen:* long, cylindrical, tapering posteriorly, often curved downward. *Pattern:* variable; carapace with distinct median line, alternating light, dark longitudinal bands; abdomen with median band varying to scattered dark spots on light background. (Figs. 9, 10). *MALE.* Cymbium moderately broad; conductor expanded distally with a spine retrolaterally; median apophysis bifid; embolus quite long, thin, arises proximally. (Fig. 15) *FEMALE.* Genitalia as in Figs. 21-22. *IMMATURES.* Body form, pattern similar to adults.



Map 3. Distribution of *Pisaurina undulata* (Keyserling).

*Natural history.* *Pisaurina undulata* is apparently the species which is most closely associated with the aquatic habitat. Collecting notes with the material examined generally indicate that this species was found in sweeps around bodies of water. Other notes include "rows of seaweed on beach" and "sweeping in flatwoods." I have collected a female from a small pond in South Carolina where it was perched head down on a narrow emergent sedge leaf. Its front two pairs of legs were brought together and projecting forward while the rear two pairs of legs brought together and projecting posteriorly; the whole spider producing a very narrow outline, resembled a resting *Tetragnatha*, a genus which is found in the same general habitat.

Adult males were collected only during the months of June, July and August, but primarily in June. Most mature females were collected from June to September, with the greatest number occurring in the last two months. Three records from March and April are from Florida. Only one egg sac was collected and was from Ala-

bama. This egg sac was spherical, white, about 4 mm in diameter, and thin enough to clearly see the eggs inside. Nothing is known concerning nursery construction or any other reproductive behavior.

*Distribution.* Southern coastal plain and lower piedmont of eastern North America from North Carolina southward to southern Florida and Cuba and eastward to Louisiana. A single immature specimen from Tecolutla, Veracruz, Mexico was found in the American Museum of Natural History collection. (Map 3).

*Material examined.* Eight males, 31 females, 207 immatures.

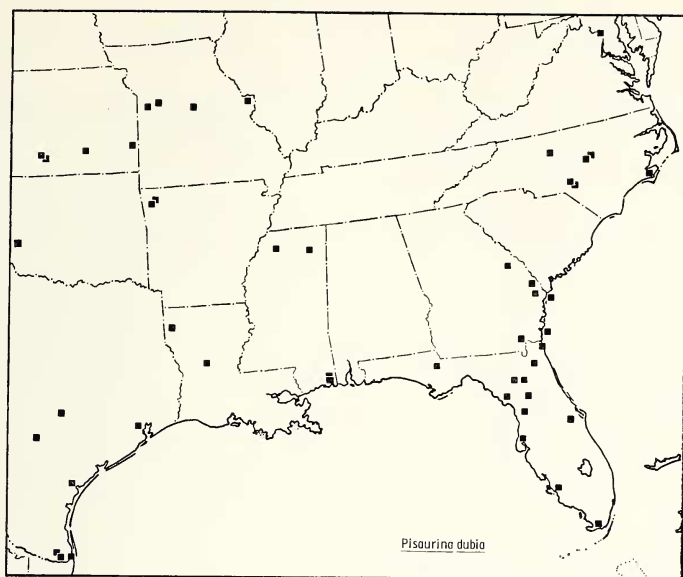
*Pisaurina dubia* (Hentz), new combination

Figures 11, 12, 16, 23, 24; Map 4

- Thomisus* ? *dubius* Hentz, 1847, Jour. Boston Natur. Hist. Soc., 5: 448, pl. 23, fig. 11, sex unknown. Holotype destroyed.
- Thomisus* ? *tenuis* Hentz, 1847, Jour. Boston Natur. Hist. Soc., 5: 449, pl. 23, fig. 12, sex unknown. Holotype destroyed. NEW SYNONYMY.
- Maypaci* *floridanus* Simon, 1898, Ann. Soc. Ent. Belgique, 42: 14. An immature female from Florida deposited in the Muséum National d'Histoire Naturelle in Paris, examined. NEW SYNONYMY.
- Thanatidius dubius*, -Bishop, 1924, Bull. New York State Mus., 252: 17, 18, pl. 33, fig. 2, ♀. Bishop, 1936, Entomol. News, 67: 242-243, ♂. Roewer, 1954, Katalog der Araneae, 2(a): 125. Bonnet, 1959, Bibliographia Araneorum, 2: 4396.
- Thanatidius tenuis*, -Bishop, 1924, Bull. New York State Mus., 252: 18-20, pl. 2, fig. 1-5, ♀. Roewer, 1954, Katalog der Araneae, 2(a): 126. Bonnet, 1959, Bibliographia Araneorum, 2: 4396.
- Thanatidius floridanus*, -Roewer, 1954, Katalog der Araneae, 2(a): 126.

*Diagnosis.* This species differs from the other members of the genus by having a strongly recurved anterior eye row, by the width of the ALE which, when divided by the width of the PME, equals more than 1.5, and by a triangular group of white hairs between the PME which are directed forward. The male palpus is the most distinctive in the genus.

*Description.* *Carapace:* depressed; wider than abdomen; triangular group of white hairs directed forward from area between PME. *Eyes:* ALE near margin of clypeus and prominently tuberculate. *Legs:* (2-1)-4-3. *Abdomen:* long, cylindrical, and tapering posteriorly from middle of its length. *Pattern:* variable; ranges from pair of longitudinal bands on carapace which converge with V-shaped abdominal band (Fig. 12) to more diffuse pattern of lines and irregular maculae (Fig. 11). MALE. Cymbium moderately broad; conductor expanded distally with a spine retrolaterally; median apophysis singular, narrowed distally; tibial apophysis often with a spine on margin. (Fig. 16) FEMALE. Genitalia as in Figs. 23, 24. IMMATURES. Body form, pattern similar to adults.



Map 4. Distribution of *Pisaurina dubia* (Hentz).

*Natural history.* The only natural history notes with males are in four North Carolina collections made from the pitcher plant, (*Sarracenia flava* L.). Of a total of six collection notes for females, three are from the pitcher plant while the remainder include pine, Spanish moss, and forest litter. Several notes from collections of immatures typically include sifting, Spanish moss, and sweeping.

Males were collected during May, June, and July, but most are from June. Females were collected during March through June, with the majority from the latter month. Only two egg sacs were found in the material examined, and both were from collections made during June. Both egg sacs were 5 mm in diameter and were spherical with a thin white covering through which one could easily see the eggs inside. Nothing is known of nursery construction or other reproductive behavior.

*Distribution.* Southern coastal plain, lower Piedmont of eastern North America from Maryland southward to southern Florida and westward to Kansas and southern Texas. (Map 4).

*Material examined.* Sixteen males, 21 females, 106 immatures.

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